

U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Geothermal Technologies Office

Low Temperature & Coproduced Resources Reservoir Thermal Energy Storage (RTES) Portfolio

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Low-Temperature Geothermal Overview

Geothermal Heat Pumps

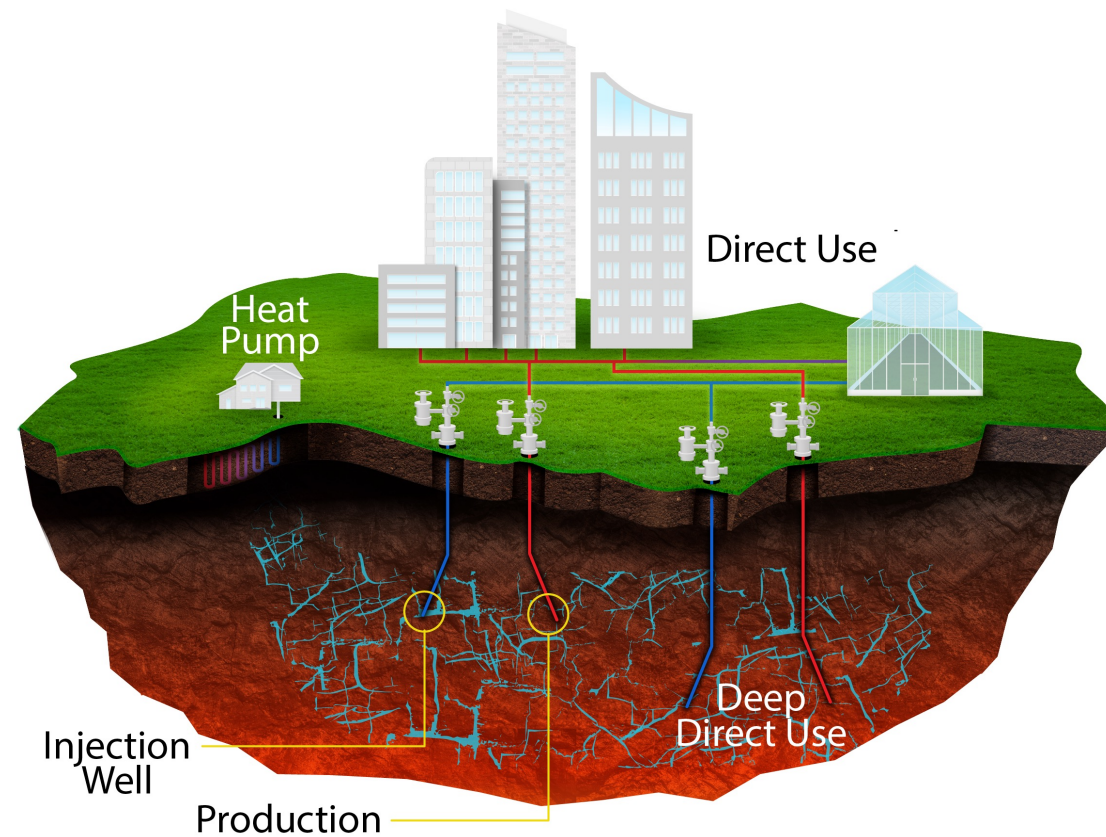
- **Entering Water Temp (40-80°F)**
- Shallow trenches to wells hundreds of feet deep
- Residential, light commercial

Direct Use and Thermal Energy Storage ★

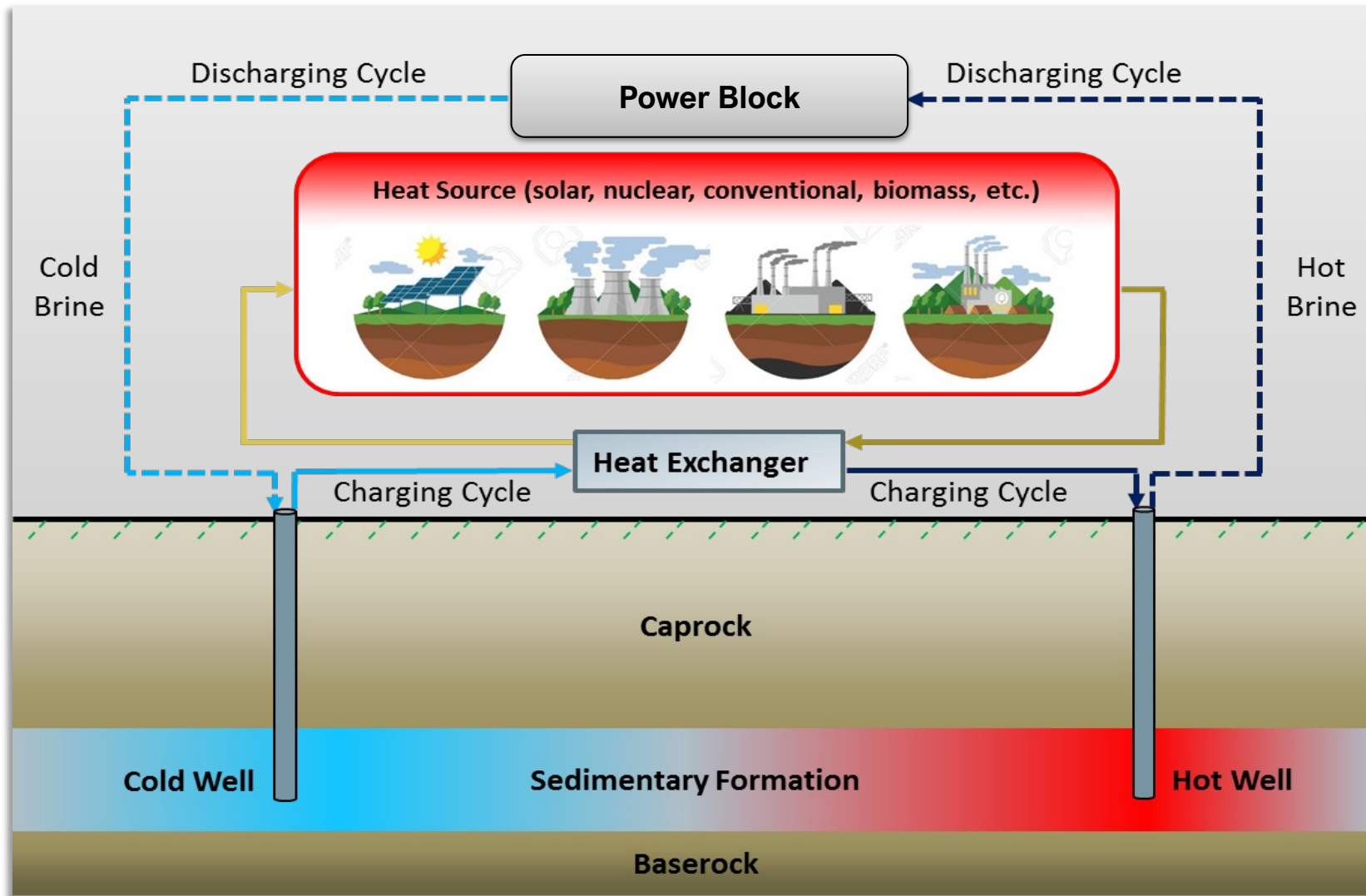
- **Entering Water Temp (80-300°F)**
- Wells hundreds to thousands of feet deep
- Large buildings, agriculture, manufacturing

Electric Power

- **Entering Water Temp (>150°F)**
- New Organic Rankine Cycle Modular
- Distributed off-grid power

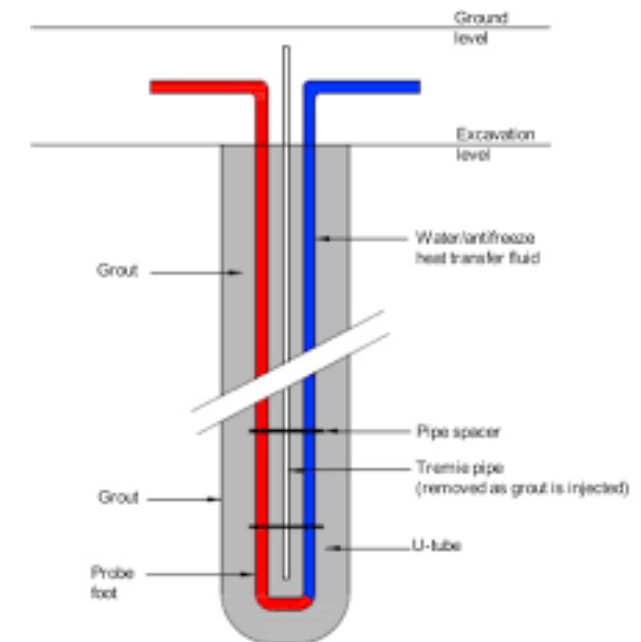


Reservoir Thermal Energy Storage (RTES) Overview



Includes:

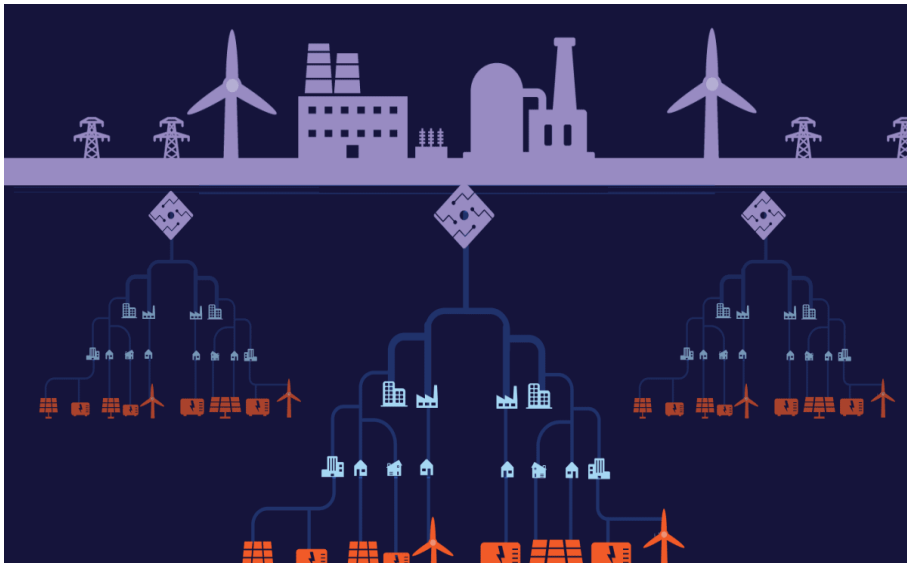
- Aquifer Thermal Energy Storage
- Borehole Thermal Energy Storage
- Example borehole:



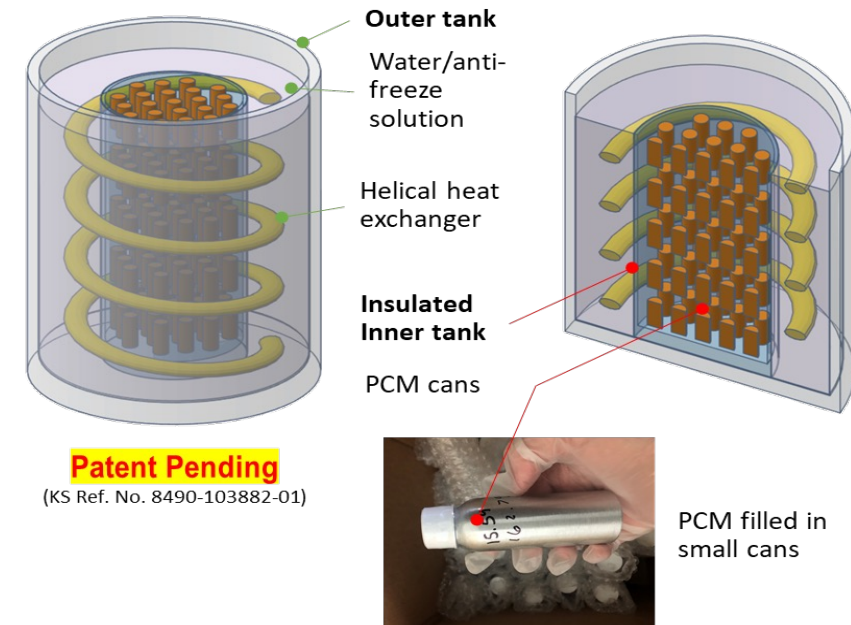
GTO's Reservoir Thermal Energy Storage (RTES) Portfolio

- Part of DOE's Energy Storage Grand Challenge
- Energy independence from the larger grid during outage events enabled by daily and seasonal energy storage technologies
- Grid services voltage support, frequency response, and grid stabilization

Terawatt-year, grid-scale RTES studies that use Earth as our battery



Materials and technical advancements that advance thermal energy storage



GTO's RTES Portfolio



GTO's Reservoir Thermal Energy Storage Portfolio:

- **Is** part of DOE's Energy Storage Grand Challenge
- **Supports** energy independence from the larger grid during outage events enabled by daily and seasonal energy storage technologies
- **Provides** grid services voltage support, frequency response, and grid stabilization



(Original of Slide 4) GTO's Reservoir Thermal Energy Storage (RTES) Portfolio

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Research	Lead Organization(s)
Resource assessment of saline brackish basins for aquifer thermal energy storage and feasibility study for use on a campus	U.S. Geological Survey Portland State University
Advanced insulating lightweight thermal shock-resistant cement suitable to withstand frequent thermal cycling	Brookhaven National Laboratory Sandia National Laboratory
Dynamic reservoir storage: Terawatt-year, grid-scale energy storage using Earth as a thermal battery	Idaho National Laboratory Lawrence Berkeley National Laboratory
Developing sustainable communities through reservoir thermal energy storage	Lawrence Berkeley National Laboratory
Developing metrics to evaluate success and progress for RTES projects	Idaho National Laboratory
Dual-Purpose underground thermal battery that integrates building heat pump system with energy storage	Oak Ridge National Laboratory